

Extensible Provisioning Protocol E.164 Number Mapping
<[draft-hollenbeck-epp-e164-02.txt](#)>

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Abstract This document describes an Extensible Provisioning Protocol (EPP) extension mapping for the provisioning and management of E.164 numbers representing domain names stored in a shared central repository. Specified in XML, this mapping extends the EPP domain name mapping to provide additional features required for the provisioning of E.164 numbers.

Conventions Used In This Document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [[RFC2119](#)].

In examples, "C:" represents lines sent by a protocol client and "S:" represents lines returned by a protocol server. Indentation and white space in examples is provided only to illustrate element relationships and is not a REQUIRED feature of this protocol.

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1. Introduction

This document describes an E.164 number mapping for version 1.0 of the Extensible Provisioning Protocol (EPP). This mapping, an extension of the domain name mapping described in [[EPP-D](#)], is specified using the Extensible Markup Language (XML) 1.0 as described in [[XML](#)] and XML Schema notation as described in [[XMLS-1](#)] and [[XMLS-2](#)].

[EPP] provides a complete description of EPP command and response structures. A thorough understanding of the base protocol specification is necessary to understand the mapping described in this document.

[RFC2916] describes how the Domain Name System (DNS) can be used to identify services associated with an E.164 number. The EPP mapping described in this document specifies a mechanism for the provisioning and management of E.164 numbers stored in a shared central repository. Information exchanged via this mapping can be extracted from the repository and used to publish DNS resource records as described in [[RFC2916](#)]. Examples used in this document were chosen specifically to illustrate provisioning concepts for the example resource records described in [[RFC2916](#)].

XML is case sensitive. Unless stated otherwise, XML specifications and examples provided in this document MUST be interpreted in the character case presented to develop a conforming implementation.

2. Object Attributes

This extension adds additional elements to the domain name mapping described in [[EPP-D](#)]. Only new element descriptions are described here.

2.1 E.164 Domain Names

An E.164 domain name is a representation of an E.164 number that has been translated to conform to domain name syntax as described in [[RFC2916](#)]. The labels used to describe the name space of an E.164 domain name are a policy matter that is beyond the scope of this document.

2.2 NAPTR Fields

According to [[RFC2916](#)], Naming Authority Pointer (NAPTR) resource records are used to identify available ways of contacting a specific node identified by a domain name created from the translation of an E.164 number. The format and processing rules for NAPTR records are described in [[DDDS-3](#)].

2.2.1 Order

The NAPTR order field, a 16-bit unsigned integer, is represented in this mapping using the XML Schema "unsignedShort" data type.

2.2.2 Preference

The NAPTR preference field, a 16-bit unsigned integer, is represented in this mapping using the XML Schema "unsignedShort" data type.

2.2.3 Flags

The NAPTR flags field is represented in this mapping using a single character. The case of the flag character is not significant.

2.2.4 Service

The NAPTR service field is represented in this mapping using a character string with a maximum length of 65 characters.

2.2.5 Regular Expression

The NAPTR regexp field is represented in this mapping using a character string with an unspecified maximum length. This field can contain numerous backslashes and should thus be treated with care.

2.2.6 Replacement

The NAPTR replacement field is represented in this mapping using a character string with a maximum length of 255 characters.

3. EPP Command Mapping

A detailed description of the EPP syntax and semantics can be found in [EPP]. The command mappings described here are specifically for use in provisioning and managing E.164 numbers via EPP.

3.1 EPP Query Commands

EPP provides three commands to retrieve object information: <check> to determine if an object is known to the server, <info> to retrieve detailed information associated with an object, and <transfer> to retrieve object transfer status information.

3.1.1 EPP <check> Command

This extension does not add any elements to the EPP <check> command or <check> response described in [EPP-D].

3.1.2 EPP <info> Command

This extension does not add any elements to the EPP <info> command described in [EPP-D]. Additional elements are defined for the <info> response.

When an <info> command has been processed successfully, the EPP <resData> element MUST contain child elements as described in [EPP-D]. In addition, the EPP <extension> element MUST contain a child <e164:infData> element that identifies the e164 namespace and the location of the e164 schema. The <e164:infData> element contains one or more <e164:naptr> elements that contain the following child elements:

- An <e164:order> element that contains a NAPTR order value.
- An <e164:pref> element that contains a NAPTR preference value.
- An OPTIONAL <e164:flags> element that contains a NAPTR flags value.
- An OPTIONAL <e164:svc> element that contains a NAPTR service value.
- An OPTIONAL <e164:regex> element that contains a NAPTR regular expression value.
- An OPTIONAL <e164:replacement> element that contains a NAPTR replacement value.

Example <info> response:


```
S:<?xml version="1.0" encoding="UTF-8" standalone="no"?>
S:<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
S:  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
S:  xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0
S:    epp-1.0.xsd">
S:  <response>
S:    <result code="1000">
S:      <msg>Command completed successfully</msg>
S:    </result>
S:    <resData>
S:      <domain:infData
S:        xmlns:domain="urn:ietf:params:xml:ns:domain-1.0"
S:        xsi:schemaLocation="urn:ietf:params:xml:ns:domain-1.0
S:          domain-1.0.xsd">
S:        <domain:name>4.3.2.1.6.7.9.8.6.4.e164.arpa</domain:name>
S:        <domain:roid>EXAMPLE1-REP</domain:roid>
S:        <domain:status s="ok"/>
S:        <domain:registrant>jd1234</domain:registrant>
S:        <domain:contact type="admin">sh8013</domain:contact>
S:        <domain:contact type="tech">sh8013</domain:contact>
S:        <domain:ns>ns1.example.tld</domain:ns>
S:        <domain:ns>ns2.example.tld</domain:ns>
S:        <domain:host>ns1.example.tld</domain:host>
S:        <domain:host>ns2.example.tld</domain:host>
S:        <domain:clID>ClientX</domain:clID>
S:        <domain:crID>ClientY</domain:crID>
S:        <domain:crDate>1999-04-03T22:00:00.0Z</domain:crDate>
S:        <domain:upID>ClientX</domain:upID>
S:        <domain:upDate>1999-12-03T09:00:00.0Z</domain:upDate>
S:        <domain:exDate>2005-04-03T22:00:00.0Z</domain:exDate>
S:        <domain:trDate>2000-04-08T09:00:00.0Z</domain:trDate>
S:        <domain:authInfo type="pw">2fooBAR</domain:authInfo>
S:      </domain:infData>
S:    </resData>
S:    <extension>
S:      <e164:infData xmlns:e164="urn:ietf:params:xml:ns:e164-1.0"
S:        xsi:schemaLocation="urn:ietf:params:xml:ns:e164-1.0
S:          e164-1.0.xsd">
S:        <e164:naptr>
S:          <e164:order>100</e164:order>
S:          <e164:pref>10</e164:pref>
S:          <e164:flags>u</e164:flags>
S:          <e164:svc>sip+E2U</e164:svc>
S:          <e164:regex>!^.*$!sip:info@tele2.se!</e164:regex>
S:        </e164:naptr>
S:        <e164:naptr>
S:          <e164:order>102</e164:order>
S:          <e164:pref>10</e164:pref>
```



```
S:      <e164:flags>u</e164:flags>
S:      <e164:svc>mailto+E2U</e164:svc>
S:      <e164:regex>!^.*$!mailto:info@tele2.se!</e164:regex>
S:      </e164:naptr>
S:      </e164:infData>
S:      </extension>
S:      <trID>
S:        <clTRID>ABC-12345</clTRID>
S:        <svTRID>54322-XYZ</svTRID>
S:      </trID>
S:    </response>
S:  </epp>
```

An EPP error response MUST be returned if an <info> command can not be processed for any reason.

3.1.3 EPP <transfer> Command

This extension does not add any elements to the EPP <transfer> command or <transfer> response described in [[EPP-D](#)].

3.2 EPP Transform Commands

EPP provides five commands to transform objects: <create> to create an instance of an object, <delete> to delete an instance of an object, <renew> to extend the validity period of an object, <transfer> to manage object sponsorship changes, and <update> to change information associated with an object.

3.2.1 EPP <create> Command

This extension defines additional elements for the EPP <create> command described in [[EPP-D](#)]. No additional elements are defined for the EPP <create> response.

The EPP <create> command provides a transform operation that allows a client to create a domain object. In addition to the EPP command elements described in [[EPP-D](#)], the command MUST contain an <extension> element. The <extension> element MUST contain a child <e164:create> element that identifies the e164 namespace and the location of the e164 schema. The <e164:create> element contains one or more <e164:naptr> elements that contain the following child elements:

- An <e164:order> element that contains a NAPTR order value.
- An <e164:pref> element that contains a NAPTR preference value.
- An OPTIONAL <e164:flags> element that contains a NAPTR flags value.

- An OPTIONAL <e164:svc> element that contains a NAPTR service value.
- An OPTIONAL <e164:regex> element that contains a NAPTR regular expression value.
- An OPTIONAL <e164:replacement> element that contains a NAPTR replacement value.

Example <create> command:

```
C:<?xml version="1.0" encoding="UTF-8" standalone="no"?>
C:<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
C:  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
C:  xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0
C:    epp-1.0.xsd">
C:  <command>
C:    <create>
C:      <domain:create
C:        xmlns:domain="urn:ietf:params:xml:ns:domain-1.0"
C:        xsi:schemaLocation="urn:ietf:params:xml:ns:domain-1.0
C:          domain-1.0.xsd">
C:          <domain:name>4.3.2.1.6.7.9.8.6.4.e164.arpa</domain:name>
C:          <domain:period unit="y">2</domain:period>
C:          <domain:ns>ns1.example.tld</domain:ns>
C:          <domain:ns>ns2.example.tld</domain:ns>
C:          <domain:registrant>jd1234</domain:registrant>
C:          <domain:contact type="admin">sh8013</domain:contact>
C:          <domain:contact type="tech">sh8013</domain:contact>
C:          <domain:authInfo type="pw">2fooBAR</domain:authInfo>
C:        </domain:create>
C:      </create>
C:    <extension>
C:      <e164:create
C:        xmlns:e164="urn:ietf:params:xml:ns:e164-1.0"
C:        xsi:schemaLocation="urn:ietf:params:xml:ns:e164-1.0
C:          e164-1.0.xsd">
C:          <e164:naptr>
C:            <e164:order>100</e164:order>
C:            <e164:pref>10</e164:pref>
C:            <e164:flags>u</e164:flags>
C:            <e164:svc>sip+E2U</e164:svc>
C:            <e164:regex>!^.*$!sip:info@tele2.se!</e164:regex>
C:          </e164:naptr>
C:          <e164:naptr>
C:            <e164:order>102</e164:order>
C:            <e164:pref>10</e164:pref>
C:            <e164:flags>u</e164:flags>
C:            <e164:svc>mailto+E2U</e164:svc>
```



```
C:      <e164:regex>!^.*$!mailto:info@tele2.se!</e164:regex>
C:      </e164:naptr>
C:      </e164:create>
C:      </extension>
C:      <clTRID>ABC-12345</clTRID>
C:      </command>
C:</epp>
```

When a <create> command has been processed successfully, the EPP response is as described in [\[EPP-D\]](#).

[3.2.2](#) EPP <delete> Command

This extension does not add any elements to the EPP <delete> command or <delete> response described in [\[EPP-D\]](#).

[3.2.3](#) EPP <renew> Command

This extension does not add any elements to the EPP <renew> command or <renew> response described in [\[EPP-D\]](#).

[3.2.4](#) EPP <transfer> Command

This extension does not add any elements to the EPP <transfer> command or <transfer> response described in [\[EPP-D\]](#).

[3.2.5](#) EPP <update> Command

This extension defines additional elements for the EPP <update> command described in [\[EPP-D\]](#). No additional elements are defined for the EPP <update> response.

The EPP <update> command provides a transform operation that allows a client to modify the attributes of a domain object. In addition to the EPP command elements described in [\[EPP-D\]](#), the command MUST contain an <extension> element. The <extension> element MUST contain a child <e164:update> element that identifies the e164 namespace and the location of the e164 schema. The <e164:update> element contains one or more <e164:add> or <e164:rem> elements. Each <e164:add> and <e164:rem> element contains an <e164:naptr> element that contains the following child elements:

- An <e164:order> element that contains a NAPTR order value.
- An <e164:pref> element that contains a NAPTR preference value.
- An OPTIONAL <e164:flags> element that contains a NAPTR flags value.

- An OPTIONAL <e164:svc> element that contains a NAPTR service value.
- An OPTIONAL <e164:regex> element that contains a NAPTR regular expression value.
- An OPTIONAL <e164:replacement> element that contains a NAPTR replacement value.

Example <update> command:

```
C:<?xml version="1.0" encoding="UTF-8" standalone="no"?>
C:<epp xmlns="urn:ietf:params:xml:ns:epp-1.0"
C:  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
C:  xsi:schemaLocation="urn:ietf:params:xml:ns:epp-1.0
C:    epp-1.0.xsd">
C:  <command>
C:    <update>
C:      <domain:update
C:        xmlns:domain="urn:ietf:params:xml:ns:domain-1.0"
C:        xsi:schemaLocation="urn:ietf:params:xml:ns:domain-1.0
C:          domain-1.0.xsd">
C:        <domain:name>4.3.2.1.6.7.9.8.6.4.e164.arpa</domain:name>
C:      </domain:update>
C:    </update>
C:    <extension>
C:      <e164:update xmlns:e164="urn:ietf:params:xml:ns:e164-1.0"
C:        xsi:schemaLocation="urn:ietf:params:xml:ns:e164-1.0
C:          e164-1.0.xsd">
C:        <e164:rem>
C:          <e164:naptr>
C:            <e164:order>102</e164:order>
C:            <e164:pref>10</e164:pref>
C:            <e164:flags>u</e164:flags>
C:            <e164:svc>mailto+E2U</e164:svc>
C:            <e164:regex>!^.*$!mailto:info@tele2.se!</e164:regex>
C:          </e164:naptr>
C:        </e164:rem>
C:      </e164:update>
C:    </extension>
C:    <clTRID>ABC-12345</clTRID>
C:  </command>
C:</epp>
```

When an <update> command has been processed successfully, the EPP response is as described in [[EPP-D](#)].

4. Formal Syntax

An EPP object mapping is specified in XML Schema notation. The formal syntax presented here is a complete schema representation of the object mapping suitable for automated validation of EPP XML instances. The BEGIN and END tags are not part of the schema; they are used to note the beginning and ending of the schema for URI registration purposes.

BEGIN

```
<?xml version="1.0" encoding="UTF-8"?>

<schema targetNamespace="urn:ietf:params:xml:ns:e164-1.0"
  xmlns:e164="urn:ietf:params:xml:ns:e164-1.0"
  xmlns="http://www.w3.org/2001/XMLSchema"
  elementFormDefault="qualified">

  <annotation>
    <documentation>
      Extensible Provisioning Protocol v1.0
      domain name extension schema for E.164 number provisioning.
    </documentation>
  </annotation>

  <!--
  Child elements found in EPP commands.
  -->
  <element name="create" type="e164:createType"/>
  <element name="update" type="e164:updateType"/>

  <!--
  Global elements.
  -->
  <element name="naptr" type="e164:naptrType"/>

  <!--
  Child elements of the <create> command.
  -->
  <complexType name="createType">
    <sequence>
      <element ref="e164:naptr" maxOccurs="unbounded"/>
    </sequence>
  </complexType>

  <complexType name="naptrType">
    <sequence>
      <element name="order" type="unsignedShort"/>
      <element name="pref" type="unsignedShort"/>
```



```
    <element name="flags" type="e164:flagsType"
      minOccurs="0"/>
    <element name="svc" type="e164:svcType"
      minOccurs="0"/>
    <element name="regex" type="e164:regexType"
      minOccurs="0"/>
    <element name="repl" type="e164:replType"
      minOccurs="0"/>
  </sequence>
</complexType>

<simpleType name="flagsType">
  <restriction base="token">
    <minLength value="1"/>
  </restriction>
</simpleType>

<simpleType name="svcType">
  <restriction base="token">
    <minLength value="1"/>
    <maxLength value="65"/>
  </restriction>
</simpleType>

<simpleType name="regexType">
  <restriction base="token">
    <minLength value="1"/>
  </restriction>
</simpleType>

<simpleType name="replType">
  <restriction base="token">
    <minLength value="1"/>
    <maxLength value="255"/>
  </restriction>
</simpleType>

<!--
Child elements of the <update> command.
-->
<complexType name="updateType">
  <sequence>
    <element name="add" type="e164:addRemType"
      minOccurs="0"/>
    <element name="rem" type="e164:addRemType"
      minOccurs="0"/>
  </sequence>
</complexType>
```



```
<!--
Data elements that can be added or removed.
-->
  <complexType name="addRemType">
    <sequence>
      <element ref="e164:naptr" maxOccurs="unbounded"/>
    </sequence>
  </complexType>

<!--
Child response elements.
-->
  <element name="infData" type="e164:infDataType"/>

<!--
<info> response elements.
-->
  <complexType name="infDataType">
    <sequence>
      <element ref="e164:naptr" maxOccurs="unbounded"/>
    </sequence>
  </complexType>

<!--
End of schema.
-->
</schema>
END
```


5. Internationalization Considerations

EPP is represented in XML, which provides native support for encoding information using the Unicode character set and its more compact representations including UTF-8. Compliant XML processors are REQUIRED to understand both UTF-8 and UTF-16. Though XML includes provisions to identify other character set encodings through use of an "encoding" attribute in an <?xml?> declaration, EPP use with character sets other than UTF-8 is NOT RECOMMENDED.

6. IANA Considerations

This document uses URNs to describe XML namespaces and XML schemas conforming to a registry mechanism described in [[IETF-XML](#)]. Two URI assignments are requested.

Registration request for the e164 namespace:

URI: urn:ietf:params:xml:ns:e164-1.0

Registrant Contact: See the "Author's Address" section of this document.

XML: None. Namespace URIs do not represent an XML specification.

Registration request for the e164 XML schema:

URI: urn:ietf:params:xml:schema:e164-1.0

Registrant Contact: See the "Author's Address" section of this document.

XML: See the "Formal Syntax" section of this document.

7. Security Considerations

The mapping extensions described in this document do not provide any security services or introduce any additional considerations beyond those described by [[EPP](#)] and protocol layers used by EPP.

8. Acknowledgements

The author gratefully acknowledges contributions to this document provided by Edward Lewis, Michael Mealling, Chip Sharp, and James Yu.

9. References

Normative references:

[DDDS-3] M. Mealling: "Dynamic Delegation Discovery System (DDDS) Part Three: The DNS Database", work in progress.

[EPP] S. Hollenbeck: "Extensible Provisioning Protocol", work in progress.

[EPP-D] S. Hollenbeck: "Extensible Provisioning Protocol Domain Name Mapping", work in progress.

[IETF-XML] M. Mealling: "The IETF XML Registry", work in progress.

[RFC2119] S. Bradner: "Key Words for Use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.

[RFC2916] P. Faltstrom: "E.164 number and DNS", [RFC 2916](#), September 2000.

Informative references:

[XML] Editors T. Bray et al.: "Extensible Markup Language (XML) 1.0 (Second Edition)", W3C Recommendation 6 October 2000.

[XMLS-1] Editors H. Thompson et al.: "XML Schema Part 1: Structures", W3C Recommendation 2 May 2001.

[XMLS-2] Editors P. Biron, A. Malhotra: "XML Schema Part 2: Datatypes", W3C Recommendation 2 May 2001.

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A. Revisions From Previous Version

-01 to -02:

Fixed typos.

Updated references.

Updated examples to keep in synch with the base EPP spec.

Simplified the schema through use of element references.

B. Full Copyright Statement

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